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NLGI Spokesman

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President's page

by H. L. HEMMINGWAY, President, N L G I

What NLGI Means to Me

The purposes of the National Lubricating Grease Institute are stated, as follows, in its Constitution:

"(a) To act as a clearing house for the collection of lawful information pertinent to the manufacture and use of lubricating grease, and to disseminate such information to manufacturers, marketers, consumers and to the public.

"(b) To promote the advancement of research and practical tests in the field of lubricating grease manufacture and use.

"(c) The study of product classifications and methods of tests; their development in cooperation with other technical societies; the publication of such data for the information of manufacturers, marketers, consumers of grease and the public.

"(d) The collection of technical information with respect to:

1. New or improved methods of lubricating grease manufacture
2. New or improved equipment for manufacturing lubricating grease
3. New or improved shipping containers for lubricating grease
4. New or improved equipment for dispensing lubricating grease
5. New or improved devices for and methods of applying lubricating grease
6. New consumer requirements for lubricating greases

"(e) The fostering of such industry policies as will tend to maintain free and open competition among manufacturers and all classes of trade who serve in distributing the products of the industry."

To me NLGI represents an organization of singularly dedicated men who have made remarkable progress in the last 22 years toward achievement of these objectives. In this period grease manufacture has developed from a mysterious art to an exacting science for the benefit of consumers throughout the world. So, first of all, NLGI means Technical Progress.

Secondly, NLGI means cooperation. Cooperation, for example, with the Anti-Friction Bearing Manufacturers. Cooperation, which replaced antagonism, and resulted in an understanding of each other's problems. Cooperation, later, with our good friends who manufacture dispensing apparatus for lubricating greases, so that our mutual customers may better match guns and lubricants.

There are many, many other instances of cooperation, but NLGI also means loyalty and individual accomplishment. The kind of selfless loyalty that won for George Miller and Ted Roehner in 1952 the NLGI Award for Distinguished Achievement. And the loyalty and accomplishment of the dozens of committee members whose efforts in terms of time, thought, and expense are too little appreciated.

In short, as NLGI enters its twenty-third year, we can all be proud of its achievements, its people and its future!

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ABOUT THE COVER

The cover picture is that of Hugh L. Hemmingway, newly elected 22nd President of the National Lubricating Grease Institute. His election was announced at the annual meeting in San Francisco, October 25-27.

Although originally a native of Wisconsin, Mr. Hemmingway's oil industry experience has taken him to Kentucky, Pennsylvania and Illinois. After graduation from the University of Wisconsin in 1932 and a depression stint as teacher of high school biology in his home town of Janesville, Wisconsin, he joined the laboratory staff of Ashland Refining in Ashland, Kentucky in 1933, leaving there in 1935 to spend the next ten years with Kendall Refining in Pennsylvania. Since 1944 he has been employed by Pure Oil in Chicago, currently as General Manager, Sales-Service Departments.

Hugh served briefly as a Director of the Institute in 1943-44, and continuously since 1949. He is a member of the A.P.I. Lubrication Committee and is Chairman of the National Placement Committee and Vice President of the Chicago Section Fuels and Lubricants Activity of the Society of Automotive Engineers. He has maintained a deep interest in the technical activity of the Institute, serving as Vice Chairman of the Technical Committee in 1951-53, and as Chairman of various subcommittees.

Mr. and Mrs. Hemmingway and their daughter and two sons reside in Highland Park, Illinois.

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Why the NLGI Recommended Practices for Lubricating Automotive Front Wheel Bearings *Was Prepared*

H. L. HEMMINGWAY
President, NLGI

This issue of the NLGI SPOKESMAN culminates the results of three years of effort involving an estimated 200 or more experts with the publication of the NLGI Recommended Practices on the Lubrication of Automotive Front Wheel Bearings. It is the work of a Subcommittee of the NLGI Technical Committee. The Subcommittee was formed and commissioned to prepare the recommended practices at the annual meeting held in Chicago in October, 1951.

During 1951, there was special emphasis in these pages on the problems associated with lubricating automotive front wheel bearings to obtain the most satisfactory performance results. In the July issue[1] there appeared an article entitled, "Is Wheel Bearing Lubrication Progressing?" This article summarized the confusing recommendations made by vehicle and bearing manufacturers for applying wheel bearing lubricants. At the annual meeting in 1951, Mr. D. G. Proudfoot of the Pennzoil Company presented a paper entitled, "Analyzing Wheel Bearing Grease Complaints," which was reproduced in the December issue of the NLGI SPOKESMAN.[2] In the conclusions to Mr. Proudfoot's paper, among the factors contributing to wheel bearing failures reported from the field, three of the five conclusions have to do with faulty application as quoted below:

"B. Many failures are due to contamination of the lubricant. This contamination may be due to:

1. Foreign matter introduced by improper handling and storage of the lubricant while still in containers.
2. Foreign matter introduced during the lubrication job by mishandling the bearings.
3. Improper cleaning.
4. Not removing all the old grease—mixtures are often bad.
5. Leaving some of the cleaning solvent.
6. Using wet or dirty air in blowing dry.
7. Water or dirt entering in service, some of it due to faulty seals.

"C. Other failures are due to lack of attention to mechanical details, such as:

1. Inspection of bearings and seals before re-lubrication and replacement where necessary. Checking for etching, brinnelling, rusting, dents, cracks, poor surface condition, etc.
2. Spinning dry bearings.
3. Improper seating of bearings, so they do not track properly.
4. Adjustment too tight or too loose.
5. Not greasing immediately after cleaning. A clean bearing let stand too long or handled too much may corrode before it is re-coated with lubricant.

"D. Many failures are due to use of excessive amounts of lubricant."

More recently, in 1954, the SPOKESMAN has carried two additional articles on wheel bearing lubrication problems, one, "To Mix—or Not to Mix, A Study of Wheel Bearing Grease Compatibilities," in the February issue,[3] and the other, "Evaluation of Wheel Bearing Grease Performance," in the May, 1954 issue.[4] One of the conclusions in

this latter paper which covered about 1,250,000 miles of field tests was, "Commonly occurring wheel bearing grease complaints can often be traced to poor lubrication practices."

Although lubricating greases for wheel bearings are a relatively small percentage of the total volume of lubricating greases manufactured, these references show that the problems associated with the lubrication of wheel bearings apparently have occupied a greater percentage of the time of those in the industry who are concerned with research or product application. The references are also in agreement that much of the trouble is a result of faulty application.

As pointed out in the July 1951 issue of the SPOKESMAN, the confusion regarding the correct lubrication of front wheel bearings is compounded by the variety of recommendations made by the different bearing manufacturers and the makers of automotive equipment. This is strange because front wheel bearing design is more closely identical from one make to another than is the case with most other components. For example, automotive engines vary widely in design and configuration, yet the lubrication recommendations are fairly similar between different makes. On the other hand, with almost identical wheel bearing designs, the lubrication intervals vary from 5,000 miles through 75,000 miles to recommendations that no periodic lubrication is necessary, the amount of lubricant varies considerably, several types of lubricant are recommended and various procedures are recommended for cleaning, re-lubricating and adjusting the wheel bearings.

Because of these varying recommendations, including some which were distributed by the lubricating grease manufacturers themselves, the Technical Committee at the 1951 annual meeting appointed a Subcommittee to develop, if possible, recommended practices for the lubrication of automotive front wheel bearings. Early in 1952, the entire Technical Committee was solicited for membership in the Subcommittee and all of the individuals who indicated an interest in this field of activity were appointed to the Subcommittee.

By the time of the 1952 annual meeting, the Subcommittee had been able to assemble all of the wheel bearing procedures used by different companies within the industry and these were summarized in a report which was discussed at a Subcommittee panel meeting during the 1952 annual meeting.

Early in 1953, photographs and diagrams for the procedure were obtained from several members of the Subcommittee and in August the first complete procedure was circulated.

By early 1954, comments, corrections, suggestions and additions had been received from the Subcommittee on the first complete draft, and in April the corrected procedure was sent to all members of the NLGI Technical Committee, to all passenger car manufacturers, to the twenty leading manufacturers of trucks, and to the principal suppliers of automotive front wheel bearings. Twenty of the active members and ten of the associated members approved the draft as written with no further changes. Ten of the active members and two associated members approved the write-up if certain changes were made and it was possible to incorporate all of these suggestions into the final publication.

The procedure once again was corrected and circulated to the members of the Subcommittee for their final approval prior to publication.

Press proofs of the final publication were available for inspection by the Board of Directors at their September meeting in Atlantic City and with their approval, plans were made for distribution of the Recommended Practices at the annual meeting. This distribution was made at the close of the afternoon session on Tuesday, October 26th. The decision was made at this time to devote this issue of *The NLGI Spokesman* to this new project of the NLGI Technical Committee.

At the meeting of the Technical Committee of the Institute on Wednesday morning, October 27th, the Subcommittee chairman urged:

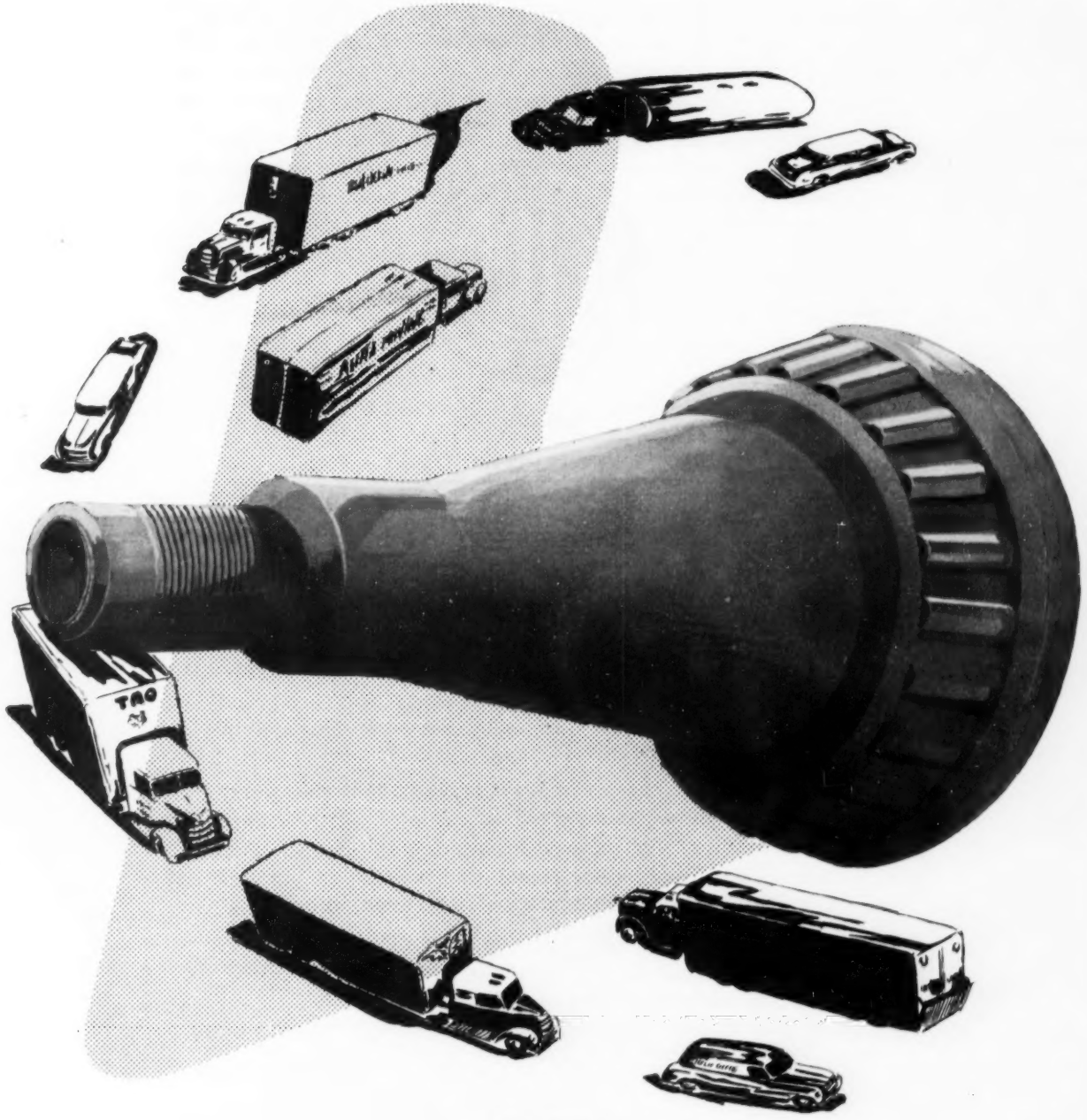
1. Full distribution of the Recommended Practices by Institute members. It is our hope that every Institute member who either sells wheel bearing grease or equipment for the application of wheel bearing grease will distribute the Recommended Practices to his own field organization and adopt it as the procedure to be used in this important application of lubricants. We believe that it is sufficiently complete and accurate to be substituted for any of the procedures now being used in the lubricating grease industry.
2. The Subcommittee should be continued to further refine, simplify and keep up to date the Recommended Practices. New mechanisms may be developed, or more effective or simplified procedures may be forthcoming, and all of these should be considered for inclusion from time to time into the Recommended Practices.
3. This is the procedure which we would recommend for reference use by vehicle manufacturers. As stated previously, at the present time almost every individual manufacturer of passenger cars, trucks or buses has his own separate recommended procedure for the lubrication of automotive front wheel bearings. The situation is not unlike that which existed before the NLGI grease classification was developed when each manufacturer recommended the grade of lubricating grease in terms of "soft," "medium," "semi-fluid," and so on, because a common terminology did not exist. We believe that the availability of this approved Recommended Practices now makes it possible for the manufacturer simply to refer to it as the procedure to be followed in the lubrication of front wheel bearings, so that all that it is necessary for him to recommend is the grade and type of lubricant and the lubrication interval.

We earnestly solicit the support of all Institute members and readers of the *Spokesman* in achieving these objectives.

1. Hemmingway, H. L., "Is Wheel Bearing Lubrication Progressing?," *NLGI Spokesman*, Vol. XV, No. 4, July 1951, pp. 16-21.
2. Proudfoot, D. G., "Analyzing Wheel Bearing Complaints," *NLGI Spokesman*, Vol. XV, No. 9, December 1951, pp. 8-17.
3. Ehrlich, Melville and Sayles, Francis E., "To Mix—or Not to Mix, A Study of Wheel Bearing Grease Compatibilities," *NLGI Spokesman*, Vol. XVIII, No. 2, May 1954, pp. 8-14.
4. Forster, E. O. and Kolfenbach, J. J., "Evaluation of Wheel Bearing Grease Performance," *NLGI Spokesman*, Vol. XVIII, No. 2, May 1954, pp. 8-14.

RECOMMENDED PRACTICES

for Lubricating Automotive Front Wheel Bearings



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FOREWORD

In view of its influence on safety and handling, the lubrication of automotive front wheel bearings is one of the most important lubrication services performed on automotive vehicles. It is also, perhaps, the most complex of the routine automotive lubrication procedures; it is the one service where satisfactory performance not only depends on the quality of the lubricant used, but also on the skill with which the various steps are performed.

Because it is a complex procedure, most vehicle and lubricant suppliers have developed recommendations for performing the service. In many cases, however, these recommendations have differed so much in individual detail that they have only served to confuse the user.

These problems were discussed in the Technical Committee of the National Lubricating Grease Institute, and it was concluded that if the lubricating grease industry could agree to a common procedure of known effectiveness, this could result in more satisfactory wheel bearing lubrication. Consequently, at the 1951 N.L.G.I. Annual Meeting, the formation of the Subcommittee on Recommended Practices for Lubricating Automotive Front Wheel Bearings was authorized. The following subcommittee which was formed included all the members of the Institute who volunteered as a result of their experience in this type of activity.

H. L. Hemmingway, Pure Oil Co., Chairman
Warren A. Brown, Deep Rock Oil Corp.
M. L. Carter, Southwest Grease & Oil Co.
Melville Ehrlich, American Lubricants, Inc.
Walter J. Ewbank, Cato Oil & Grease Co.
J. W. Lane, Socony-Vacuum Oil Co.
G. H. Link, Shell Oil Co.
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W. E. Pope, Consumers Cooperative Assn.
C. C. Schrotberger, Jesco Lubricants Co.
Wilson Simmons, Battenfeld Grease & Oil Corp.
Martin Stark, Esso Standard Oil Co.
Merle Turner, Sunland Refining Corp.
R. M. Welker, Gulf Oil Corp.
O. L. Yarham, Cities Service Oil Co.

The members of the Subcommittee gave generously of their time in the preparation of the initial drafts. The greatest portion of the work of assembling the suggestions and comments into a final procedure was carried out by Mr. P. V. Toffoli and Mr. R. A. Shewry of the Technical Service Department of The Pure Oil Company. The assistance of Mr. A. R. Idzepski of the Studebaker Corp., and Mr. R. J. Mahaffay of the Chek-Chart Corp. is also gratefully acknowledged.

October, 1954.

NATIONAL LUBRICATING GREASE INSTITUTE
4638 J. C. Nichols Pkwy., Kansas City 12, Mo.

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Recommended Practices for Lubricating Automotive Front Wheel Bearings

IMPORTANT—*Dealer personnel obtain authorization for replacement of defective parts.*

INTRODUCTION

The re-lubrication of front wheel bearings is one of the most important services performed in the maintenance of equipment. The two points to be emphasized on this service are **cleanliness** and **adjustment.**

Cleanliness

The utmost care should be exercised in maintaining cleanliness. This means that all the component parts of the bearing assemblies, the brake mechanism, and the grease should be protected from dirt and grit while the work is being carried out. Cleanliness should also mean that all the old lubricant be removed, both from the hub and the bearings, even if the old lubricant has the same appearance as the new lubricant.

Adjustment

The most careful job of re-lubrication can be performed on the bearings and the results spoiled by incorrect adjustment. Therefore, extreme care should be taken in making the correct adjustment of the bearings.

NAMES OF WHEEL BEARING PARTS

Component Parts of a Roller Type Front Wheel Bearing (Figure A)

1. Hub cap
2. Dust Cap
3. Cotter Pin
4. Spindle Nut
5. Washer
6. Cone of Outside Bearing
7. Cup of Outside Bearing
8. Hub
9. Cup of Inside Bearing
10. Cone of Inside Bearing
11. Grease Retainer
12. Spindle

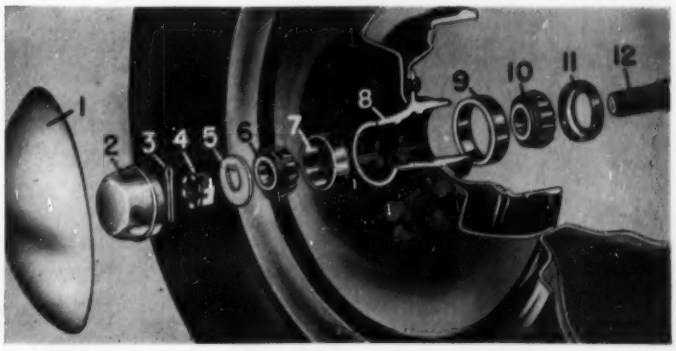

Figure A

Component Parts of Ball Type Front Wheel Bearing (Figure B)

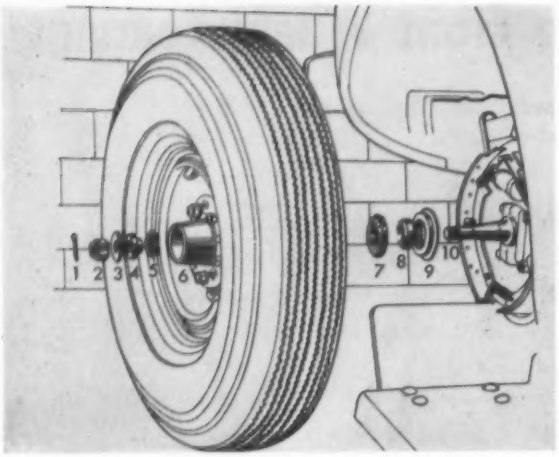

Figure B

1. Cotter Pin
2. Spindle Nut
3. Washer
4. Inner Race of Outside Bearing
5. Ball Assembly of Outside Bearing
6. Hub
7. Ball Assembly of Inside Bearing
8. Inner Race of Inside Bearing
9. Grease Retainer
10. Spindle

(Outer races of inside and outside bearings not shown in Figure B)

Disassembly

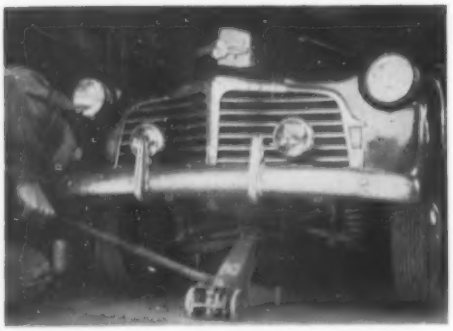

Figure 1

1. Raise one or both front wheels enough to clear the floor

(Make sure vehicle is secure on jack or lift before starting disassembly). See Figure 1.

2. Optional Step

(Not applicable on some models). Drive wooden wedge between steering knuckle support and spindle body. (This eliminates all play except that in bearing assembly).

3. Check wheel for play and freedom of rotation

(Grasp tire tread as shown in Figure 3). Alternately push with one hand and pull with the other to determine looseness. Excess play indicates too loose adjustment, or worn or broken bearings. Turn wheel to check freedom of rotation. Drag indicates brakes holding, too tight bearing adjustment or defective bearing. Rattling sound may indicate broken bearing. Note any abnormal conditions for further reference.

Figure 3

4. Place clean wiping cloths on clean area of workbench on which to place parts as they are removed

5. Remove hub cap and place on cloth with bright side down

Hold cap so that it will not fall on floor and be marred or dented.

Note: Remove and service only one wheel at a time to avoid mixing the parts from the two wheels. (Insert screwdriver or hub cap remover between flanges of hub cap and wheel. Turn screwdriver blade enought to pry off cap. Never attempt to drive cap off as it may be damaged. Be careful not to mar wheel finish). See Figure 5.

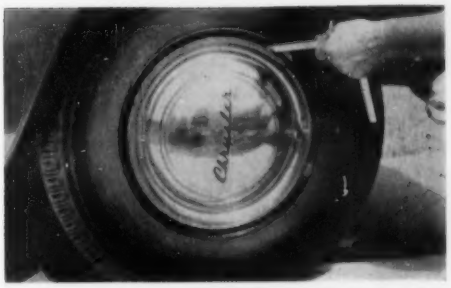

Figure 5

6. Remove inner dust cap

(Pry off by tapping screwdriver with light hammer or use special dust cap tool). See Figure 6.

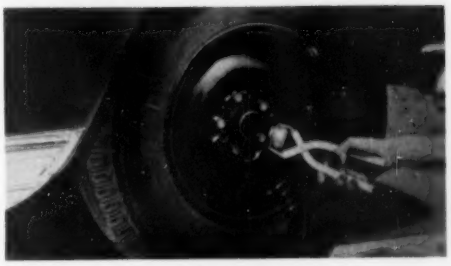

Figure 6

7. Remove cotter pin and discard

See Figure 7. (Straighten ends and remove with pliers or cotter pin puller. Always throw used cotter pins away).

8. Remove spindle nut and washer

See Figure 8.

Note: Left hand thread (counter-clockwise) is used on left side of some cars.

Figure 7

9. Jiggle wheel slightly to loosen outside bearing, then take out freed bearing parts and place on clean cloth

Optional Alternate: Replace dust cap, (lightly—just enough so it won't fall off. This prevents bearings from falling onto floor). See Figure 9.

10. Remove wheel carefully

(Do not drag wheel off spindle. Lift slightly and pull toward you keeping wheel centered with spindle to help prevent damage to grease retainer. On cars or trucks with heavy wheels removal of wheel from brake drum or hub will make hub removal easier and will help prevent damage to retainer).

Note: If wheel cannot be pulled out due to tight brakes (a) turn wheel while pulling or (b) work brake pedal up and down vigorously, this may loosen brakes sufficiently or (c) if these methods fail, brake adjustment will have to be loosened.

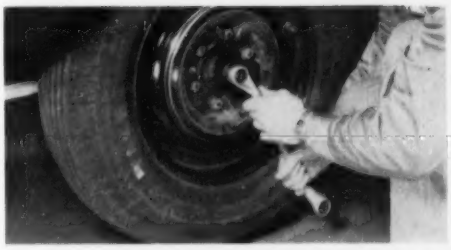

Figure 8

11. (Use this step if Alternate 9 is used, otherwise disregard this step).

Remove dust cap, washer and cone of roller bearing, or inner race and ball assembly of ball bearing

(If retaining washer is used, pry off with screwdriver). Place parts on cloth.

Figure 9

Cleaning

Figure 12

12. Clean brake drum

(Use clean, dry bristle brush to remove dust and dirt from brake drum. Remove any excess grease from drum). Place wheel with brake drum over cloth on floor, inner bearing side down. See Figure 12.

Figure 13

13. Brush dust out of brake shoe area

(Protect spindle with cloth during this step). See Figure 13.

Figure 14

14. Wipe spindle clean

(Use clean wiping cloth to remove old lubricant). See Figure 14.

15. Where ball bearings are used, remove inner race of inside bearing from spindle; also remove dust shield if used

Figure 16

16. Remove inside bearing and grease retainer from wheel

See Figure 16. (Insert a brass drift or a short length of broomstick through small bearing end of hub until it rests against inside bearing assembly. Tap end of stick gently with a soft mallet while moving other end around bearing assembly. Do this until grease retainer is loose in hub. Remove grease retainer and inside bearing assembly, and place on cloth).

17. (Optional)

Remove all lubricant from hub and wipe clean

See Figure 17.

Figure 17

18. Clean both inside and outside bearing cups, or outer races of ball bearings

See Figure 18. (Use a clean cloth dipped in Stoddard solvent or kerosine and wipe dry).

Figure 18

19. Clean bearings, washer and spindle nut

The use of a "bearing washer" is preferable since it forces solvent through the inside of the bearing cage. See Figure 19. (If a bearing washer is not available, wash units separately in container of clean Stoddard solvent or kerosine. Use of a small brush with no loose bristles will be helpful).

Figure 19

20. Clean grease retainer

(Use clean cloth only. Do not wash leather or felt seals in solvent).

21. Dry bearings thoroughly

See Figure 21. (Lubricant will not stick to wet or oily surfaces. Lubricate bearing immediately to prevent rust). **Caution:** Do not spin balls or rollers by air pressure as it will ruin bearings. **The air supply should be clean and dry.**

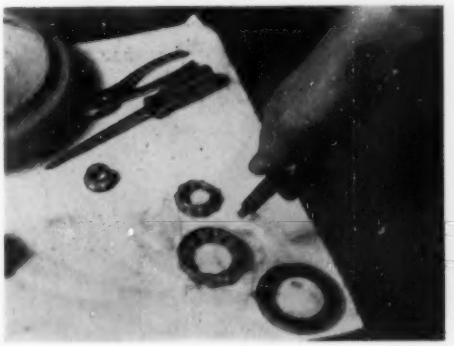

Figure 21

Figure 22

Inspection

22. Inspect cups and cones of roller bearings, races and ball assemblies of ball bearings, and grease retainers

See Figure 22. (Inspect carefully for pitting, scratches, excessive wear or other damage. Light blue or straw discoloration of ball bearings does not indicate bearing failure).

23. If either cups, cones, ball assemblies or races are worn, pitted, scratched or indented, replace entire bearing assembly

(Remove outer races or cups in the same way as inner bearing was removed—See Step 16).
Warning: If a new bearing is needed, install a new assembly. Never replace only a part of a bearing assembly as premature failure of bearing may result.

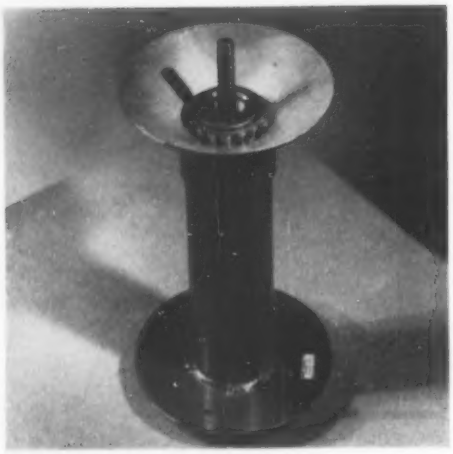

Figure 25

24. Replace damaged or worn grease retainer

In any case, the best and safest practice is to install new grease retainers.

Lubrication

25. To lubricate bearings, use a bearing packer to be sure lubricant reaches all bearing surfaces

See Figure 25.
Note: Hand packing of bearings is not recommended because of the difficulty of **completely** filling the inside bearing spaces with grease and the greater possibility of contaminating the grease with dirt. Roller bearings are particularly difficult to pack by hand since **all the space inside the bearing cage must be filled with grease,** by working the grease into one end of the cage until it oozes out at the other end. **Inadequately packed bearings may fail prematurely.**

Figure 26

26. Follow equipment manufacturer's instructions for use of bearing packer

Figure 26 shows a roller bearing cone in place on a wheel bearing packer.

27. Force sufficient grease into bearings to flush out any trace of old lubricant or cleaning solvent

See Figure 27.

Figure 27

28. Remove bearings from packer

29. After packing bearing, lightly coat all surfaces of assembly with grease

(Not too much grease—just enough to cover). See Figure 29.

Figure 29

30. Coat spindle and inside of hub with a thin layer of grease to prevent rusting

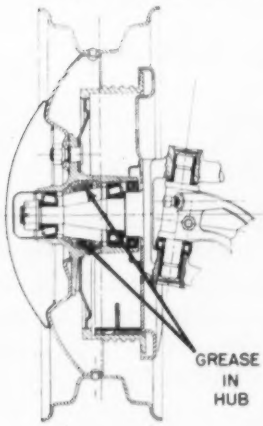

Figure 30a

See Figure 30.

Caution: The hub should **not** be packed with grease but, for roller bearings only, a leading roller bearing manufacturer recommends filling the hub cavity to the inside diameter of the cups as shown in Figure 30a.

A large excess of grease increases temperatures, may cause leakage onto brakes, and can do no lubricating anyway.

Figure 30

Figure 33

Reassembly

31. Where ball bearings are used, install dust shield and inner race of inside bearing on spindle

(For better protection of grease retainer, some car manufacturers recommend placing inner race of inside ball bearing **in the ball assembly** before hub is replaced on spindle).

32.(a) If inside and/or outside bearings are replaced, the cups or outer races should be pressed into the hub by means of an arbor press

If press is not available, they may be tapped into place with a soft hammer and a brass drift. The use of a clean piece of pipe (slightly smaller in diameter than the outside of the cups or outer races, and with the end out of square) in place of a drift will tend to eliminate cocking or distortion during seating in hub.

Figure 35

32.(b) Before installation of grease retainer, distribute a thin layer of grease on inner and outer edges

33. Install cone of inside roller bearing or ball assembly of ball bearing and grease retainer in hub

Tap retainer in straight using a soft hammer. See Figure 33.

34. Replace hub on spindle

(Support weight of wheel and keep centered. Be careful not to damage grease retainer or spindle threads).

35. Replace outside cone of roller bearing, inner race and ball assembly of ball bearing, washer and spindle nut

(Tighten nut with fingers). See Figure 35.

Adjusting

Figure 36

36. Bearing adjustment

(If wheel was removed from drum on disassembly, replace wheel on drum before adjusting bearings). A. Rotate wheel and tighten nut until it binds slightly. See Figure 36. (Use a wrench not longer than 8 inches or grasp larger wrench close to spindle nut. With wheel rotating, tighten nut until a slight bind is felt. This slight bind means that all surfaces are in contact). Back off the nut one flat

(60 degrees, or less) and check for wheel play. If no rock or play is felt, insert new cotter pin, having essentially same diameter as hole in spindle, in slot nearest cotter pin hole. If rock or play is felt, tighten nut slightly until another cotter pin slot of nut lines up with cotter pin hole in spindle, then insert cotter pin, making sure head fits down into castellation of nut. When adjustment is completed, turn wheel to check for freedom of rotation. **Note:** Do not mistake looseness in the king pins for loose bearings. If the king pins are loose, the wheel will shake with the bearings drawn tight.

B. Where torque wrench is used for adjusting bearings, follow vehicle manufacturer's recommendation.

Completion of Reassembly

37. Bend cotter pin in locked position

(Always use new cotter pin—pins are cheaper than accidents. Bend one leg toward end of spindle. Cut off and bend other leg back over nut). See Figure 37. **Note:** If radio static suppressor is used in dust cap, cut off one end of cotter pin so that it does **not** cover cone-shaped hole in end of spindle. Clean inside of dust cap, contact on end of suppressor and end of spindle to insure good contact.

Figure 37

38. Replace dust cap

Never hit cap in center. Use special tool (illustrated) for this purpose, or screwdriver and light hammer and tap against flange on cap. See Figure 38.

39. Clean and replace hub caps

(Make sure no sand or gravel is trapped in cap. Never hit hub cap in center. Place hands on edges and press cap into place. Wipe of dirt and finger marks.)

Figure 38

40. (If Optional Step 2 is used)
Remove wood wedge between steering knuckle support and spindle body

41. Repeat process on other front wheel

42. Remove jack or lower lift and check off service order

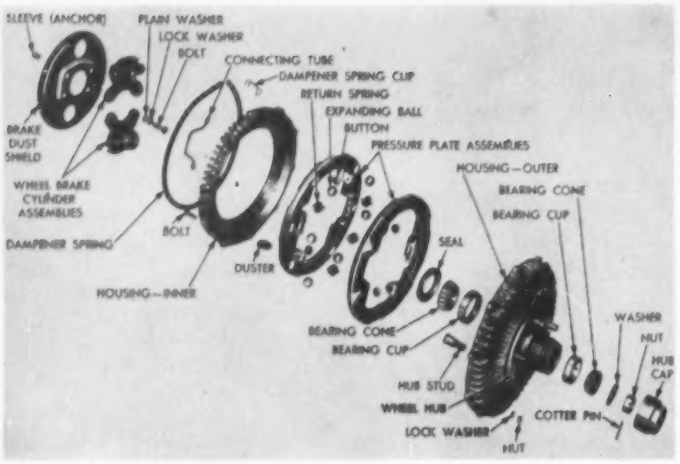

Figure C

Wheels with Disc Brakes

Certain Chrysler models produced since 1949 are equipped with disc brakes. On wheels, with brakes of this type, it is necessary to separate the inner and outer brake housings for access to the wheel bearings. Proper procedure for servicing wheel bearings on wheels with brakes of this type follows: See Figure C.

Figure 44

43. Remove tire and wheel assembly from brake housing in usual manner

44. Remove dampener springs and dampener spring clips as shown in Figure 44.

Care should be taken not to lose dampener spring clips.

Figure 45

45. Remove housing attaching bolts around the outside of the brake housing

Inner and outer housings are matched sets. Cut-outs cast in each housing (See arrow, Figure 45) should be mated on reassembly. It is good practice to mark the housings carefully with chalk or paint so the two halves can be reassembled in the proper position.

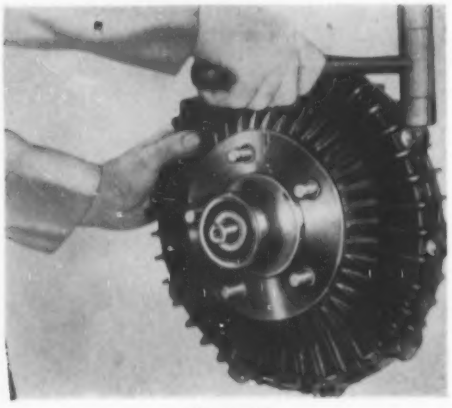

Figure 47

46. Remove dust cap, cotter pin, nut and washer (See steps 6 through 8).

47. Separate inner and outer housings by tapping lightly at one of the attaching bolt hole flanges with a soft hammer

See Figure 47. (When housings begin to separate, remove cone of outside bearing, using care to avoid damage to the bearing).

48. Clean, inspect and re-lubricate bearing assemblies, hub and spindle

(See steps 12 through 34).

Figure 49

49. Reassemble inside bearing, hub and outer brake housing

See Figure 49. (Inner and outer housings must be properly mated).

50. Install cone of outside wheel bearing, washer and nut

Adjust bearing, install new cotter pin and replace dust cap.

Figure 51

51. Install the housing bolts, lock washers and nuts

See Figure 51.

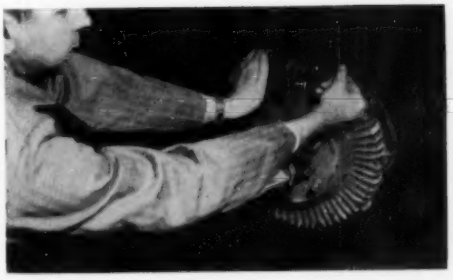

Figure 52

52. Install dampener spring and dampener spring clips

See Figure 52.

53. Replace wheel and tire assembly

See Figure 53.

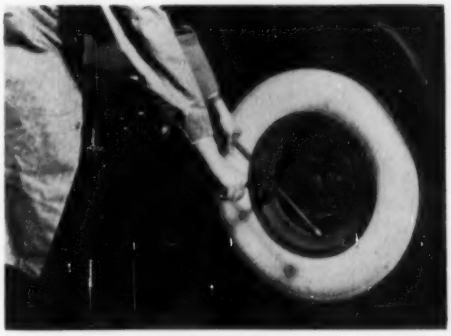

Figure 53

54. Repeat process on other front wheel

55. Remove jack or lower lift and check off service order

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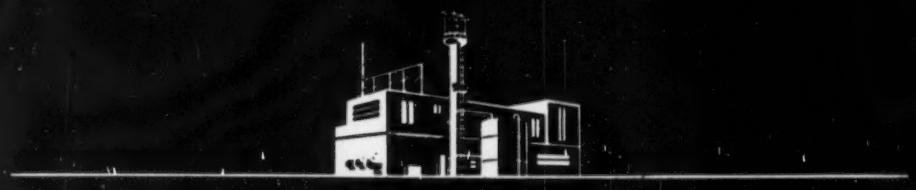

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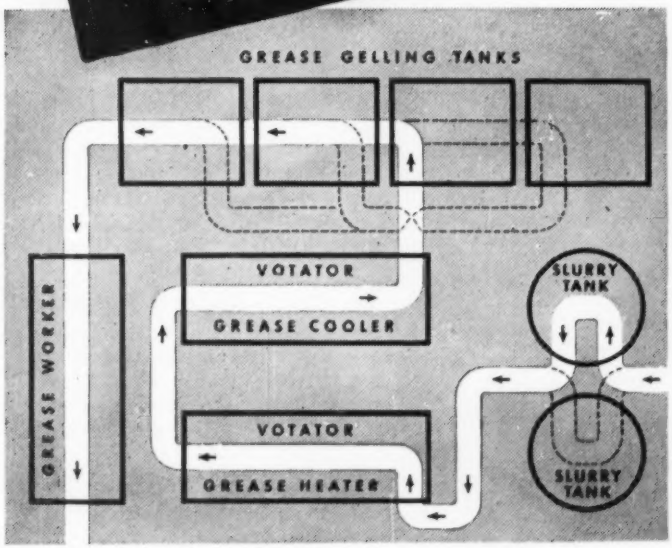

VOTATOR* Grease Making Apparatus converts an aluminum or lithium base slurry into smooth, glossy-sheen grease of highest quality . . . on a continuous basis. The result is high volume production coupled with many operating economies such as: pan-cooling is eliminated; less space is required than for batch methods; reworking is eliminated because of close quality control; operator attention is minimized because of closed-system, automatic control.

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Standardization Metal Drums Dimensional Standards

R. C. REED
The Texas Company

Last month an article, "Why Container Standardization," written by Shell's C. H. Phillips and J. G. Scully appeared in this marketing section. It gave the background and benefits of the standardization of containers.

This month the Chairman of the Publicity Committee, Petroleum Packaging Committee, gives us a further insight of the history and advantages of uniform specifications. The author of this article is Texas Company's R. C. Reed, Supervisor of Packages and Shipping, Refining Department.

Prior to 1950, a number of organizations were interested in establishing standard specifications for the metal drums used in the Petroleum and Chemical Industries. Among these were the National Association of Purchasing Agents, the Steel Shipping Container Institute, the API Lubrication Committee and the National Lubricating Grease Institute. Very little progress had been made, however, at the time the Petroleum Packaging Committee of the Packaging Institute was organized in early 1950. All of the other agencies mentioned above gave their approval to the Petroleum Packaging Committee taking on this problem.

A sub-committee was formed, known as the Metal Drum and Pail Committee, and its first chairman was Mr. A. Douglas Murphy of Esso Standard. Later, when Mr. Murphy became Chairman of the Petroleum Packaging Committee, Mr. Fred Langner of Socony-Vacuum took over as chairman of this sub-committee.

This sub-committee had many obstacles to overcome in developing and co-ordinating acceptable specifications for all of the agencies involved. There was no uniformity in the dimensions of drums of the same capacity as manufactured by different manufacturers nor by the same manufacturer in different plants. Naturally there was some resistance on the part of the manufacturers to the adoption of specifications which would require changes in equipment and in inventory of steel sheets. Also, any changes made required the approval of the Interstate Commerce Commission and the Freight Classification Committee. Also it was necessary to co-ordinate the specifications with the Manufacturing Chemists Association as they are the second largest user of metal drums.

The advantages to be gained by having uniform specifications were such that the Petroleum Packaging Committee considered any effort required to develop and get them approved would be justified. The advantages which have been gained by the specifications, as finally adopted, are:

1. A greater quantity of product can be filled into the standard drums. The so-called 55-gallon drum, as previously manufactured, did not have sufficient capacity for 55 gallons of most petroleum products. The new drum will have this capacity plus the necessary outage. These remarks also apply to the 30-gallon drums. The 15-gallon drum has been made uniform in body size with the new 120-pound grease drum and will have a capacity of 16 liquid gallons.

2. Considerable trouble had been experienced in the past with palletizing, handling and loading drums due to variations in height and diameter of drums of the same capacity. This condition will be overcome with drums having uniform dimensions.

3. It has been necessary in the past to have an ICC-17E drum with a convex head for flammable products and for U.S. Government contracts. Industry, on the other hand, has used an ICC-17X drum which has a flat head. The new universal drum will meet specifications ICC-17E, will have a convex head, and will be substituted for both the old ICC-17E and the ICC-17X.

4. Filling operations will be simplified as all drums will be of uniform dimensions and of uniform capacity.

5. Drum manufacturers will benefit as they will need to carry an inventory of only one size sheet for each size drum. Also, it will not be necessary for them to change the equipment set-up to manufacture drums for different customers.

The Drum and Pail Sub-Committee of the Petroleum Packaging Committee has devoted four years of hard work to developing uniform specifications and getting the necessary approvals for their adoption. They were given final approval at the September meeting of the Petroleum Packaging Committee in Philadelphia and will now be published by the Packaging Institute and by the Steel Shipping Container Institute. It is anticipated that eventually they will be made American Standards by the American Standards Association.

The drums involved in this standardization program are:

55-gallon (U.S.) Tight Head Universal Drum
400-Lb./55-gallon (U.S.) Full Removable Head Drum
30-gallon (U.S.) Tight Head Universal Drum
16-gallon (U.S.) Tight Head Universal Drum
5-gallon (U.S.) Tight Head Universal Drum
5-gallon (U.S.)/35-Lb. Lug Cover Universal Pail

machines that work for machines

We usually think of machines as working for men, and ultimately, of course, they all do.

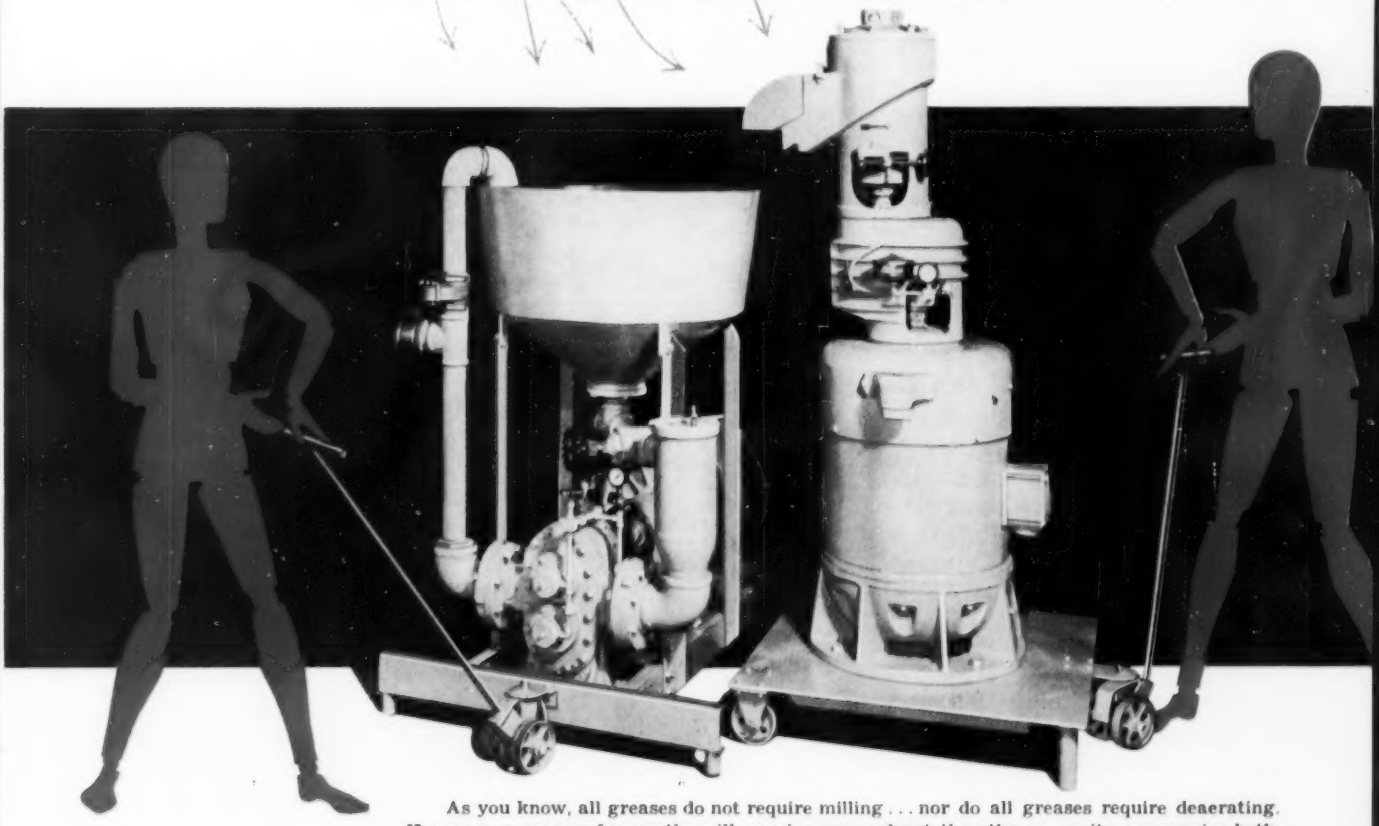
But many, many machines exist only to work for other machines. You'll frequently find a machine that makes or processes component parts or materials for another machine . . . or, provides the motive power for another machine . . . or, controls another machine.

In the case of the Morehouse Mill, we find a machine that is in the unique position of helping *all* other machines . . . by participating in the production of the many standard and specialized greases needed to keep those other machines operating efficiently and effectively.

Today, greases of many types are being made with better uniformity, greater homogeneity, and higher quality because they are processed, in one or more stages of their production, on Morehouse Mills.

Basically, a Morehouse Mill imparts a shearing or tearing action to the product processed. In one sense it is a super grinding mill . . . a mill brought to a high degree of perfection by decades of research, field tests, and plant operation on hundreds of products. As the material passes between the stator and rotor below, the intensity of the shearing forces is determined by the peripheral speed of the rotor, the clearance between the stator-rotor surfaces, and the rheological properties of the material.

Thus, in your plant, the Morehouse Mill may be used to accomplish reduction of particle size, dispersion of particles, production of colloidal systems, homogeneization, or dispersion of fillers. The result . . . a possible if not definite upgrading of your product, better customer satisfaction, more widespread acceptance, a better competitive position, and . . . better profits.



The Morehouse Mill and grease deaerating equipment illustrated produces up to 25,000 lbs. of high quality grease per hour. Each unit independent, portable. Note casters and tow attachment. Portable and non-portable units of lower capacity are also available.

As you know, all greases do not require milling . . . nor do all greases require deaerating. However, a grease frequently will require one and not the other . . . or it may require both. That is why Morehouse Mills are available separately or in combination (no plumbing required) with Morehouse deaerating equipment. All equipment can be made portable.

Complete technical information on Morehouse Mills and deaerating equipment, the results on their use in the field, and the services of our field engineers in solving your particular grease processing problems are available to you without obligation.

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Patents and Developments

Orthosilicate and Siloxane Base Greases

Although mineral oil greases can be made to have satisfactory low torque requirements at low temperatures for use in outdoor equipment, such compositions are extremely volatile and have poor service life due to low stability to oxidation. Also, mineral oil base greases with suitable high temperature properties are too stiff to render service at temperatures much below -20°F. These are the reasons why work has been directed recently toward development of synthetic base grease.

Alkyl orthosilicates are claimed, in the California Research Corporation patent 2,681,313, to possess superior thermal stability, higher viscosity index and better hydrolytic stability than corresponding alkyl diesters of dicarboxylic acids.

The alkoxysiloxanes have an extremely low pour point, high viscosity index, as well as outstanding oxidative stability in presence of inhibitors. A mixture of both, together with smaller amounts of an alkali metal soap, was found to yield superior grease compositions when properly blended and inhibited. The final composition should contain at least 50 per cent by weight of orthosilicate or alkoxysiloxane or of both.

One example of a suitable grease involves mixing together at room temperature 85.5 parts of 2-ethyl-hexyl orthosilicate, ten parts of lithium stearate, four parts of acrylic resin solution, and one-half part of phenyl-alpha-naphthylamine. The resin was Acryloid HF855. The mixture was heated rapidly with stirring until solubility was obtained at 380°F, and the solution was cooled rapidly by pouring into a water-cooled metal dish. The gel was broken to produce a smooth grease by passing it through a 60-mesh wire screen followed by several finer screens up to 200-mesh.

Inorganic Colloid-Thickened Grease

More recently, inorganic colloid-thickened greases have been prepared by treating an inorganic hydrogel with a hydrophobic surface-active agent and subsequently incorporating the treated hydrogel in lubricating oil. Thereafter, it was necessary to subject this hydrous mixture to evaporation treatment to eliminate the water. This "direct transfer" process entails an unduly extended dehydration procedure.

In patent 2,681,314, Shell Development Company claims that evaporation requirements can be reduced by heating a hydrophobic surface-active agent and a hydrogel of an inorganic colloid at a temperature above about 60°C for a period of at least 30 minutes. Under these conditions, a gel is created having uniformly hydrophobic properties of improved filterability from which a substantial proportion of the water may be separated prior to incorporation in a water-immiscible oil. Filterability is further improved by carrying out water separation before the heated mixture of hydrogel and hydrophobic agent have cooled below a minimum temperature of 60°C. By this means, at least 25 per cent, and often over 50 per cent of the water present in the hydrogel may be eliminated prior to incorporation into the oil, and the grease produced has uniform properties.

The following is an example of the preparation of a typical grease:

Ninety-four pounds of a silica hydrogel containing 4.75 pounds silica is prepared from aqueous sodium silicate and sulfuric acid. 2.13 pounds of a cationic hydrophobic surface-active agent (described hereinafter) is added to this hydrogel, which is contained in a vat heated by a steam coil and agitated by a propeller stirrer. The agent dissolves in about 20 minutes, by which time the temperature has reached 81°C. Heating is continued for 35 minutes to a temperature betwee 95° and 97°C. At this point it can be noted that the hydrogel appears homogeneous and that the surface-active agent is apparently evenly distributed throughout. The mixture is filtered in about 40 minutes using an Oliver continuous vacuum filter having three square feet of filter surface covered with a filter cloth. Approximately 40 per cent of the water is removed from the hydrogel by this filtration. Subsequent thereto the partially dehyrated gel is agitated with 50 pounds of a light refined mineral lubricating oil, subjected to milling to create a hydrous grease structure and then processed in an agitated film dryer, to remove substantially all of the water to a figure lower than about 0.5 per cent water based on the final grease. Following dehydration the resulting slurry is milled to obtain a grease structure.

The cationic surface-active agent utilized in this grease is a one-third amide formed between animal fat acids and a condensation product of epichlorohydrin and ammonia. This condensation product is preparable as follows: Epichlorohydrin is added in small incremental portions to concentrated aqueous or alcoholic ammonia at temperatures between about 20° and about 60°C, preferably between 30° and 50°C. The time of addition may vary widely but is preferably in the order of ½-1 hour although times as short as about ten minutes may be employed. Following an extra heating period of about 30-90 minutes, excess ammonia is removed. In the condensation reaction a weight ratio of ammonia to epichlorohydrin of between five to one and ten to one is preferred. The inorganic halide of the halohydrin is converted to an

inorganic salt (such as by the addition of caustic) which is filtered or decanted from the product. After removal of water or other solvent which is present, it is found that a complex mixture of condensation products has been obtained comprising predominantly 5-25 per cent of 1,3-diamino-2-hydroxy propane in addition to dimers and higher polymers thereof. This mixture is then reacted with animal fat acids (or acids from other equivalent higher fatty acid sources) and heated at a temperature between 150° and 225°C for periods between 15 minutes and 24 hours. It has been found that the use of ratios enabling the production of partial amides having between ¼ and ¾ of the amino nitrogen groups in amide form, results in the preparation of hydrophobic surface-active agents having optimum properties for the present purpose.

News Items

Titanium Pigment Corp., 111 Broadway, New York 6, N. Y., is advertising availability of triethanolamine titanate which may be of use in greases (*Chem. & Engrg. News* 7-26-54 p. 2999).

Du Pont is advertising availability of Estersil-GT as a new type grease thickener, different from any used previously. It is a pelletized form of highly divided amorphous silica chemically treated with a "raincoat" (*Petroleum Processing* 8/54 p. 1234).

Preparation of silicone oil containing CH_2SCN groups –Cooper (*J. Amer. Chem. Soc.* 5-5-54 p. 2499).

Standard Oil Co. (Indiana) is advertising its newly formulated Stanolith Grease MP as featuring an increased multi-purpose range which will reduce grease inventories, since one grease will lubricate many kinds of heavy equipment. It has higher oil viscosity and greater EP properties for use in steel, cement and rubber mills, mining operations, etc. (*Coal Age* 5/54 p. 149).

Union Oil Co. of California advertised its new, improved Unoba Multi-purpose grease as being made with high viscosity, 100 per cent paraffin base oils, a highly effective oxidation inhibitor, and with the two finest known barium and lithium soap bases. (*Engineering News-Rec.* 5-6-54 p. 4-5).

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by C. J. Boner

Chief Research Chemist
Battenfeld Grease and Oil Corp.

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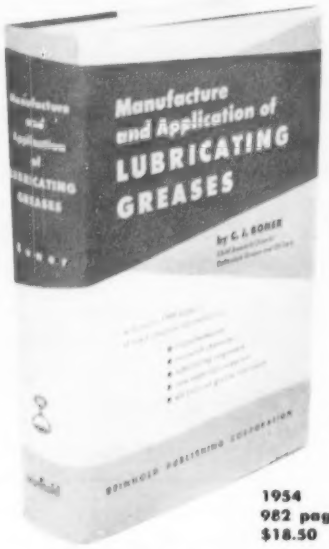

1954
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Here in one giant volume . . . the most complete storehouse of information ever published on the composition, properties and uses of lubricating greases!

The book begins by describing in detail the structure and theory of lubricating greases. Then follow chapters on the various raw materials, processes and manufacturing equipment. Lubricants containing specific thickeners, including such recent developments as lithium soaps, complex soaps and non-soap gelling agents, receive special attention.

Of major interest is the large section on present uses and future trends of lubricating grease products. Here you'll find the complete details of when, where, and how to apply a specific lubricant for any given purpose.

Everyone concerned with the preparation or use of grease lubricants will find Boner's book of enormous practical value. Manufacturers and lubricating engineers will find here a complete breakdown of the effects of each ingredient or treatment upon the characteristics of the final product, and a full explanation of the physical and chemical methods used in measuring these characteristics. Suppliers of fats, oils, additives, thickeners and other raw materials will gain new ideas for future product research and development. In addition, users of grease products will learn the properties of available lubricants and the major purposes that each fulfills.

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23
BIG CHAPTERS

1 Introduction
2 Structure and Theory
3 Additives Other Than Structural Modifiers
4 Raw Materials
5 Manufacturing Processes
6 Equipment for Lubricating Grease Manufacture
7 Aluminum Base Lubricating Greases
8 Barium Base Lubricating Greases
9 Calcium Base Lubricating Greases
10 Lithium Base Lubricating Greases
11 Sodium Base Lubricating Greases
12 Lead Soap Lubricating Greases
13 Strontium Base Lubricating Greases
14 Miscellaneous Metal Soaps as Components of Lubricating Greases
15 Mixed Base Lubricating Greases
16 Complex Soap Lubricating Greases
17 Non-Soap Thickeners for Lubricating Fluids
18 Fillers in Lubricating Greases and Solid Lubricants
19 Residua and Petrolatums as Lubricants
20 Analysis of Lubricating Greases
21 Tests of Lubricating Greases and Their Significance
22 Application of Lubricating Greases
23 Trends in Lubricating Greases

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PEOPLE in the Industry

Witco Announces Several Personnel Changes

Max A. Minnig

J. H. Gifford

R. B. Sucher

Announcement is made of the election of Max A. Minnig as Executive Vice President of Witco Chemical Co.

Joining Witco's Natural Gas Division in 1946, Mr. Minnig successively has been National Sales Manager for Rubber Chemicals, Director of Sales, and Vice President. He received his education at University of Oklahoma.

Two executive appointments have been made to the Witco-Continental Akron, Ohio, office.

John H. Gifford has been named Technical Director, Carbon Black Division, and Robert B. Sucher has been appointed Assistant Sales Manager, Rubber Chemical Products Promotion.

Technical Director Gifford was graduated by Yale University in 1936, and formerly was associated with the B. F. Goodrich Co. He is a member of the American Chemical Society, Rubber Group, and of the Akron Group.

Assistant Sales Manager Sucher received a degree from Findlay College. Prior to joining Witco he was affiliated with Marbon Corp. (Borg-Warner), and with the Inland Mfg. Co. He is Past Chairman of the Southern Ohio Rubber Group, Dayton.

W. F. George, until recently District Sales Manager for the Hooker Electrochemical Company, has joined the Witco Chemical Company, as Special Assistant to the President.

Well known in the chemical industry with which he has long been associated, he organized and conducted W. F. George Chemicals, Inc., for several years and later was co-publisher of "Chemical Industries," now known as "Chemical Week."

Mr. George is a charter and life member of the Salesmen's Association of the American Chemical Industry and a past president of The Chemists' Club, of which he still is a trustee.

Midwest Research Appointments

Dr. Charles N. Kimball, President, Midwest Research Institute, has announced the appointment of William B. House, formerly associated with the National Alafalfa Dehydrating & Milling Company of Lamar, Colorado, as a Research Chemist at the Midwest Research Institute.

Mr. House received his Bachelor's and Master's degree from the University of Missouri, specializing, respectively, in agricultural chemistry and nutrition and biochemistry.

Prior to joining the Midwest Research Institute he had been employed by the Hercules Powder Company, by the Agricultural Chemistry Department of the University of Missouri and by the National Alfalfa Dehydrating and Milling Company. According to Dr. Kimball, Mr. House has extensive experience in nutritional research.

Mr. House is a member of the Alpha Zeta, Gamma Sigma Delta, Sigma Xi, the American Chemical Society, the American Association for the Advancement of Science and the American Society of Animal Production.

The Midwest Research Institute, founded in 1945 by over 400 industrialists and leading citizens in the midwest, was organized on a non-profit basis to provide facilities for industrial, agricultural and economics research in the mid-continent area.

Approaching their 10th anniversary, Midwest Research Institute has completed over 1300 research projects for more than 500 different clients in some 18 different scientific fields.

One pound of crude oil can produce three times as much heat as a pound of TNT, which is made from toluene, an oil product.

Haas to ADM Board of Directors

The election of Frank C. Haas to the board of directors of Archer-Daniels-Midland Company has been announced following the firm's annual meeting of stockholders. All other directors and officers were reelected.

Haas is a resident of Cleveland, Ohio, headquarters of the ADM Chemical Products Division. He joined the company in 1929 as chemical director of the ADM Wyandotte, Michigan plant. Following several promotions, he was elected a vice president in 1950. He is a native of Union City, New Jersey, and studied chemical engineering at Columbia University.

Haas is vice chairman of the steering committee on fatty acids and a member of the steering committee for glycerine of the American Soap and Glycerine Producers Association. He is also a member of the National Lubricating Grease Institute, the American Society of Lubricating Engineers, and the American Oil Chemists Society.

According to Thomas L. Daniels, ADM president, who made the announcement, the chemical products division which Haas heads has one of the most promising growth potentials of any of the company's divisions. The division is building a plant for a new family of chemicals at Ashtabula, Ohio. When completed in 1955, the plant will produce higher fatty alcohols which will be used in new types of detergents, lubricating greases and other products.

New Deep Rock Controller

William F. Styler, Jr., has been named controller of Deep Rock Oil Corporation, President William H. Garbade has announced.

Styler, a Deep Rocker since 1949, has served for the past three years as assistant to the president. He will continue in this capacity, along with his new duties as controller. As assistant to the president, he will continue in charge of all special deals involving Deep Rock.

Styler has been instrumental in recent years in procuring special deals for Deep Rock involving the acquisition of producing oil and gas properties and the financing of company activities.

Styler succeeds Allyn R. Bell, Jr., who has resigned to become controller of General Crude Oil Co., in Houston, Tex. Bell joined Deep Rock in September, 1948.

Styler came to Deep Rock five years ago as manager of the company's tax department. Before joining Deep Rock he had experience in public accounting and tax work for other oil companies. The new controller received a Bachelor of Science degree in business administration from the University of Arkansas in 1940 and served as teacher and football coach in Little Rock for a year.

When Colonel Drake drilled the first oil well in 1859 his hand-made tools represented an investment of $76.50.

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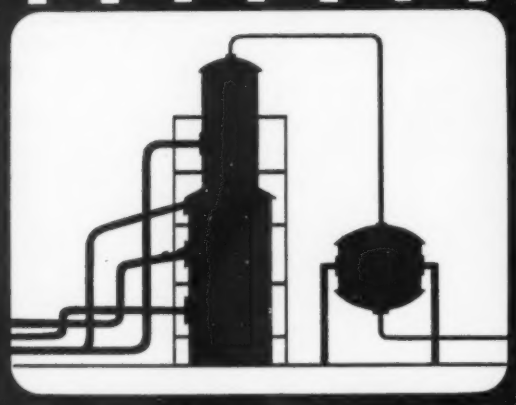

Have you investigated the outstanding qualities of Cenwax A and Cenwax G in the compounding of lithium greases?

Cenwax A (12-Hydroxystearic Acid) produces grease with exceptional shear stability, good water resistance, and stable greases over wide temperature ranges. Compounding greases at low temperatures as well as quick cooling are desirable features.

Cenwax G (Hydrogenated Castor Oil Glyceride) An excellent glyceride of 12-Hydroxystearic acid where the use of a glyceride is preferred because of processing conditions.

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Five employees of the Nopco Chemical Company of Harrison, N. J., at a ceremony held recently commemorating their twenty-fifth anniversary with the company. All were awarded solid gold watches by T. A. Printon, President and Chairman of the Board of Nopco. They are (left to right): George R. Zust, Helen W. Silver, Dr. Bernard A. Dombrow, T. A. Printon, who made the presentations, William Sramek, Francis J. Licata.

Levy to Midwest

Announcement is made of the appointment of Dr. Sheldon L. Levy, formerly a member of the faculty at Brown University, as manager of the Applied Physics Division at the Midwest Research Institute.

Born in Chicago, Ill., Dr. Levy received his Bachelor's and Master's degree from the Illinois Institute of Technology where he also taught from 1946 to 1948 in the Mathematics Department, and his Ph.D. from Brown University, where he held the rank of Assistant Professor in Applied Mathematics.

While at Brown, Dr. Levy was also responsible for the direction of the Metals Research Laboratory.

Dr. Levy joined the U. S. Navy in 1944, holding the rank of Ensign.

He is a member of Eta Kappa Nu, Sigma Xi, the American Physical Society and the Mathematical Association of America. He is co-author of "The Influence of Magnetization on Ultrasonic Attenuation in a Single Crystal of Nickel or Iron-Silicon."

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Tremaine to Rhodia

Breckinridge K. Tremaine, formerly associated with E. I. du Pont de Nemours & Co., has joined Rhodia, Inc., New York, as Technical Director of its Industrial "Alamask" Reodorant Division. Since April of this year, he has been on loan to Rhodia as acting technical director.

Mr. Tremaine brings to Rhodia a broad knowledge of industrial chemical requirements in many processing and manufacturing fields. He was largely responsible for the development of industrial reodorants of value in both air and stream odor abatement, and has contributed a number of technical papers in the field of odor control.

A graduate of the University of Delaware, Mr. Tremaine started his career with du Pont's organic chemical department as chemist and technical representative in Wilmington and New England. From 1930 until 1936 he was with Canadian Industries Ltd., as Ontario and Western District Manager for the company's Dyestuffs and Chemicals Division. He then returned to du Pont to work on market development for the Fine Chemicals Division, continuing in this work on a national basis until the start of World War II when he became assistant to the manager of production.

Following the war, Mr. Tremaine was appointed to du Pont's newly-formed technical section, to continue his work in market development of surface active compounds. In 1949 he was assigned to special development of aromatic chemicals for industrial markets, continuing in this field until the purchase of the Industrial "Alamask" Reodorants Division by Rhodia.

B. K. Tremaine

Mr. Tremaine is a member of the American Chemical Society, the Technical Association of the Pulp and Paper Industry and the American Association of Textile Chemists and Colorists and the Chemists' Club. He is credited with U.S. patents in the field of Detergents and Aromatics.

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Neuner Honored By Emery

A. W. Schubert, left, Emery's executive vice president, congratulates John Neuner for his fiftieth anniversary with the company.

At a recent special luncheon, John Neuner received from A. W. Schubert, executive vice president of Emery Industries, Inc., Cincinnati, a diamond service pin in recognition of his 50 years service with the company. Robert Van Tuyle, vice president in charge of production; Robert Aylesworth, manager of development laboratories; and Ralph Sheets, director of industrial relations, were also present to honor his outstanding record.

Mr. Neuner started with Emery when he was only 13 years old. He spent much of his time with the Candle Division, moving to Mariemont, Ohio, when operations were begun there. When the candle business was disposed of, he returned to the main plant, St. Bernard, to take his present job with the Development and Service Laboratories.

Woods Promoted

Thell C. Woods, formerly process superintendent of Deep Rock Oil Corporation's Cushing refinery, has been promoted to assistant to the vice president, it has been announced by R. M. Chesney, vice president.

Raymond Feasel will become process superintendent replacing Woods. Feasel was formerly fuels manufacture supervisor.

In another change, Quentin E. Benedict was promoted from lubricants manufacturing supervisor to assistant process superintendent. Thomas Coleman Jones, formerly shift supervisor, has been promoted to cracking plant foreman.

Du Pont Executives To Europe

Shown preparing to board a European bound plane with Du Pont's "Magic Barrel" are R. Carter W. Jones at left, sales promotion manager, and Roberts W. Brokaw at right, sales promotion specialist of the company's Petroleum Chemicals Division. The airways captain is Robert D. Lindsay. The Magic Barrel was developed to show the public a few of the vast number of products derived from petroleum. This presentation, which has been given through the United States, is a part of the annual tour sponsored by National Sales Executives, Inc.

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Industry NEWS

Quart Motor Oil Cans Made Standard

Quart motor oil can dimensions have been made uniform in a new American Standard—B64.1-1954. This standard will benefit oil companies, the packaging industry, service stations and manufacturers of cans and machinery for filling and closing cans.

Standard quart oil cans will run through the filling and closing machines of an oil company, regardless of the make of the machines or the cans. Also, cans made according to the new American Standard are easily packed in cartons of the same size and may be displayed to better advantage on standard-size racks in service stations. Can manufacturers benefit by this uniformity because they can supply the same can to all oil companies.

The organizations who participated in the work on this American Standard are the American Petroleum Institute, National Lubricating Grease Institute, National Bureau of Standards, Packaging Institute, and the U.S. Department of the Navy—Bureau of Supplies and Accounts.

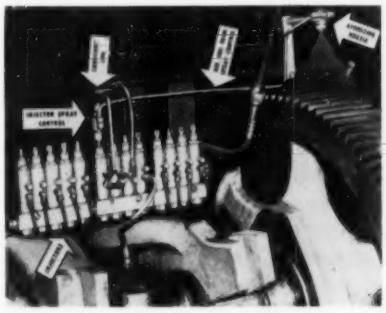
ASLE Announces New Publication

The American Society of Lubrication Engineers announce that the Proceedings of their first National Symposium has just come off the press. This publication "Fundamentals of Friction and Lubrication in Engineering" contains 12 papers by world famous experts in their various fields. These papers, all published for the first time, include complete bibliographies with over 300 references. "Fundamentals of Friction and Lubrication in Engineering" is an essential to every Engineering Library as an up-to-date source of information in this important phase of engineering.

It is available (paper bound) at $3.50 ($3.00 to ASLE Members) from The American Society of Lubrication Engineers, 84 East Randolph Street, Chicago 1, Ill.

Automatic Mist Lubricator For Open Gears

New spray control valve operates automatically in conjunction with centralized lubrication systems to provide controlled mist lubrication for open gears. Valve may be assembled to any lubricant injector in the centralized system, mounted either adjacent to, or remote from, gears to be lubricated. As the injector begins to discharge lubricant, movement of the injector indicator stem permits spray control valve to open, allowing regulated air to pass spray nozzle which atomizes lubricant into a fine, uniform mist of air and lubricant.



Automatic Mist Lubricator

Lubricant output can be increased, as desired, by diverting lubricant from two or more injectors through lubricant line to adjustable spray nozzle. For complete details, write Lincoln Engineering Company, Industrial Division, 5702-30 Natural Bridge Avenue, St. Louis 20, Missouri.

Swan-Finch Buys Pennsylvania Gas Wells, Lease

Robert F. Six, chairman of the board of Swan-Finch Oil Corporation has announced the purchase of four natural gas wells and the lease to Pennsylvania Tract 38 in the Benezette Gas Field, Elk County, Pennsylvania. Total monthly revenues from the four existing wells approximate $60,000 exclusive of Pennsylvania royalties.

Swan-Finch purchased the lease from Gross Associates, of Harrisburg, Pennsylvania. Income from the purchase goes to Swan-Finch retroactive to September 1, 1954. Gas from wells in this area commands the highest price of any natural gas anywhere in the world—27½ cents per thousand cubic feet at the well-head, compared with approximately 5 to 12 cents a thousand in Texas, for example.

Ultimate recoverable reserves from the lease are estimated by Huntley and Huntley, leading Pittsburgh geologists, at 6.01 billion cubic feet.

Under the terms of the purchase, Gross Associates are proceeding with the drilling of a fifth well on the property. If this new well does not produce at an initial open flow of 4 million or more cubic feet daily, a sixth well must be drilled by Gross Associates without cost to Swan-Finch.

A fifth well is believed necessary to tap the full available reserve since Well Number 4, in the southeast corner of the lease, is believed unconnected with the most prolific part of his tract, notwithstanding the fact that it produced with an initial open flow of 200 million cubic feet per day. The new well is being drilled west of Number 3, which delivered an initial open flow of 38 million cubic feet per day.

The Benezette Gas Field has been delineated on its northeast end, but the southwestern extreme has not yet been found. The new Swan-Finch lease is located in the southwestern area of the field, but the productive zone is known to range south of the tract.

Huntley and Huntley arrived at the 6.01 billion cubic feet figure for recoverable reserves on the basis of the most conservative possible estimate of the position of the water contact line, which runs from north to south through the area. Should the water contact line prove to lie west of the present estimate, reserves in the tract would be very substantially increased according to Huntley and Huntley.

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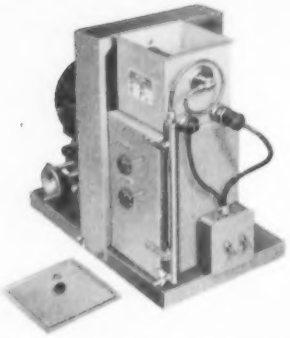
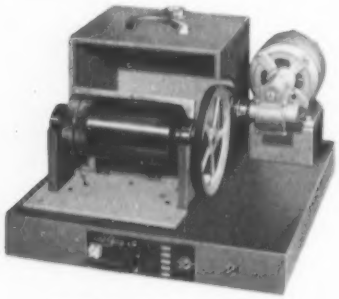


WATER WASHOUT TESTER
CAT. NO. 4165



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Midwest Research Reports on Symposium

Martin Goland, Director for Engineering Sciences at Midwest Research Institute, has announced the publication of the proceedings of the symposium on "Operations Research in Business and Industry," held in Kansas City last April under the sponsorship of the Midwest Research Institute.

The theme of the symposium centered around the role of operations research with respect to industrial management problems. Leading authorities from industrial firms, research institutes and educational institutions throughout the nation presented the various aspects of this problem. Talks by the individual speakers covered analysis and history of operations research, the tools used, computational technique, case histories and other pertinent subjects.

Midwest Research Institute regularly sponsors technical symposia on subjects of particular current importance to industry and business. Operations research is of vital interest to many firms, as indicated by the fact that the symposium was attended by 232 persons from 27 states and Canada representing 137 different companies and institutions.

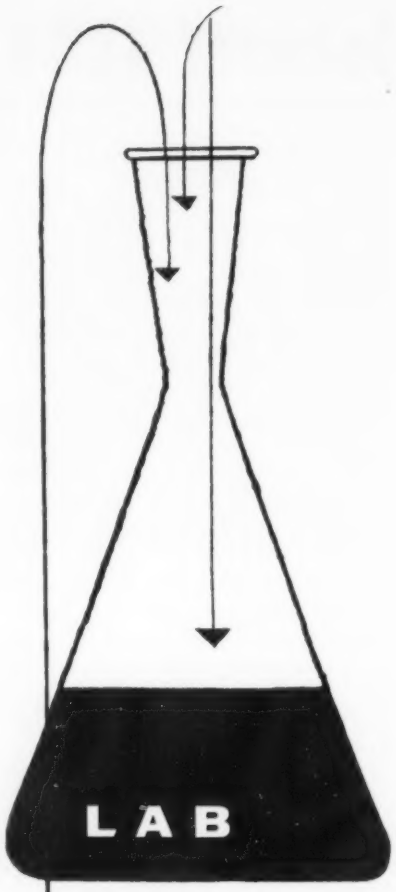
Copies of the proceedings may be obtained from Midwest Research Institute, 4049 Pennsylvania Avenue, Kansas City, Missouri, at a price of $5.00.

New Swift Bulletin

An eight-page bulletin recently announced by Swift & Company, Industrial Oil Dept., catalogs all of Swift's Industrial Oil and Fatty Acid products.

Included are detailed specifications, shipping information, and suggested usage on products of animal, vegetable and marine sources including: oleic acids, red oils, stearic acids, glycerine, hydrogenated and sulfonated products; tallow, lard oils and stearines as well as data on specialized products including defoamers, esters, metal and wool processing oils and Spermaceti USP.

For further information, write Swift & Company, Industrial Oil Dept., 1800 165th Street, Hammond, Indiana.



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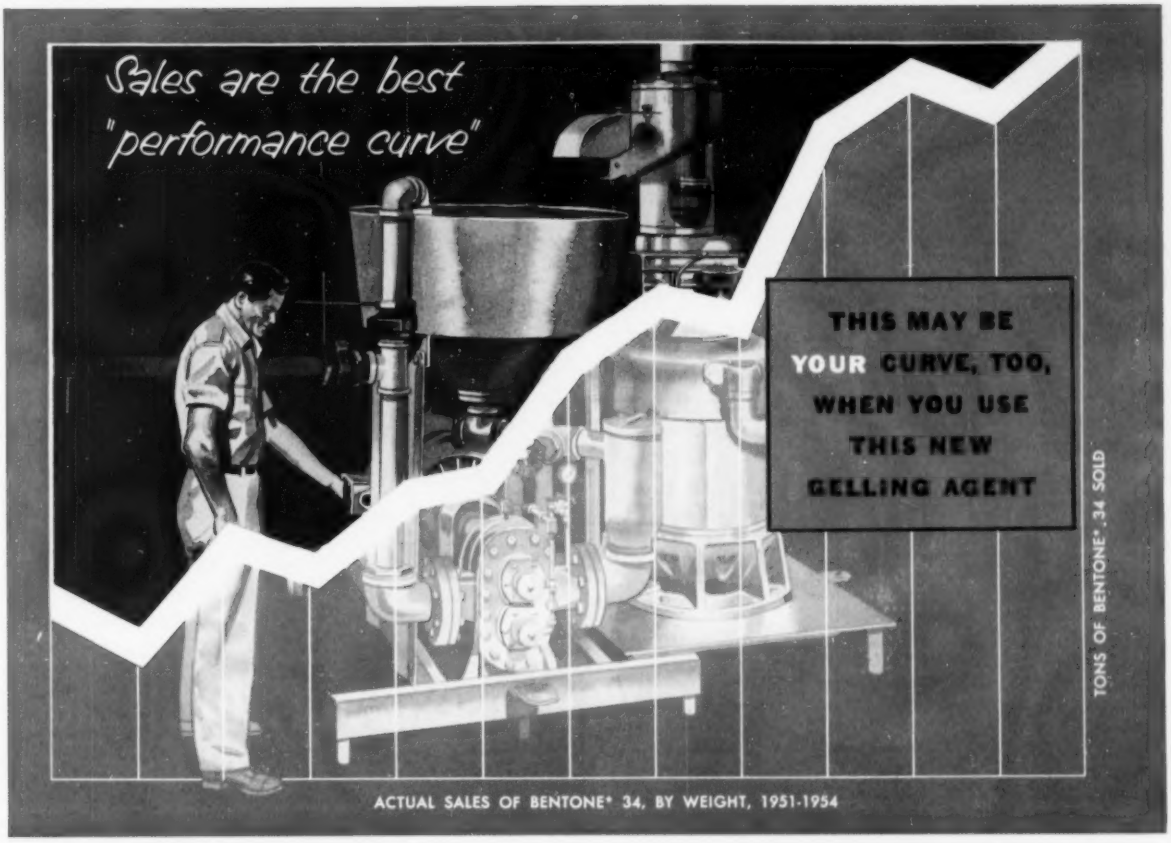
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Saponification No.	120-130
Free Inorganic Acid	0.2% max.
Iodine Value	20-40
Apparent Solidification Point (titre)	Approx. 44° C.
Softening Point	45-48° C.
% Sulfur	No corrosive sulfur

A.O.C.S. Methods

Will Your Business Get Its Share of Tax Relief

The sweeping new tax code is estimated to have cut $1,363,000,000 from business and personal taxes this fiscal year. Perhaps twice that sum will be saved in future years.

Is your business getting ready to take its legitimate share of this tax relief? Many of the provisions are already in effect. The operating decisions you are making day by day may determine whether or not you can get the most benefit from the new provisions.

You should consult your tax adviser at once if you have not already done so. The gimmicks are many. The "ifs," "ands," and "buts" pop up all over the place. It will take an expert to guide you through the fine print. Though in general the new tax law is much more liberal toward business than the old one, some loopholes have been plugged and some provisions bear down a little harder.

Seven Main Areas

Seven main areas can be spotlighted. But remember, every business has its own conditions to consider. No general statement should be applied without full study and consultation with an expert.

Faster Depreciation

Depreciation write-off is greatly speeded. A much greater portion of the cost of new equipment can be written off in the early part of the useful life of the asset. Under one new method, for example, double the amount previously allowed can be written off in the first year. Obviously this is big news to a business that wants to modernize or expand.

The deductions are no greater over the entire useful life, but they are much greater in those years when the expenditure is most felt and before returns may begin to taper off because of obsolescence. Ask your tax adviser how the various new methods can help you—the "declining balance" method . . . the "sum-of-the-years'-digits" method . . . Don't let the lingo throw you!

Ask him whether a "switch" from one method to another might be advantageous. Be sure to note that some switches are automatically permissive and some are not, and that the kind of records you keep (or fail to keep) may defeat the benefit the law holds out to you.

If you have been leasing equipment instead of buying outright, you may want to re-appraise your practice in the light of the new laws. And perhaps you will want to look into earlier disposal of used equipment.

Immediate Deductions for Research and Development

Research and development costs may now be deducted in the year they are incurred. You no longer have to wait to get a patent or give up your experiment as a failure before deducting your costs.

More Realistic Tax Accounting

Tax accounting under the new law has been brought more nearly into line

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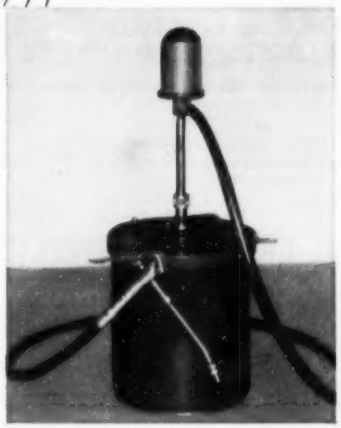

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with generally accepted accounting principals. Income reporting can be more realistic. You can deduct from current receipts estimates of such future expenses as refunds and rebates, allowances for discounts, claims for damages, etc. You can report advance rentals in the years in which they will be earned and in which you will have expenses such as maintenance or repairs to deduct.

The estimated expenses can be deducted if you can make a reasonably accurate estimate based on your own experience or that of others in similar circumstances. Of course only those anticipated expenses which apply to the revenue of the current period may be deducted.

Altogether there will be less differance between taxable income and net income as it is figured by accountants for ordinary business purposes.

You May Elect Lower Corporate Taxes

Partnerships and proprietorships now may, under certain circumstances, elect to report and be taxed as corporations. Some businesses will want to take advantage of the lower corporate rates at certain levels, remembering, however, that once elected the practice must be continued unless there is a 20% or more change in ownership. And remembering, too, that though owners may escape an immediate high personal tax bracket by electing to report as corporations, assets kept in the business may later be subject to estate tax or income tax (as dividends or capital gains).

Aid in Accumulating Earnings for Expansion

Retention of earnings for future expansion or modernization is made easier by the granting of a $60,000 accumulation-credit (total for all years). Also, if any part of a greater accumulation is deemed not for "reasonable needs" of the business, the penalty tax is applied only to that particular part, not to the entire accumulation for the year, as formerly.

Most important of all, burden of proof is now laid upon the Internal Revenue Service, not on you. In most cases, a business with legitimate savings for bonafide purposes of expansion or modernization need no longer fear the penalty tax.

Some Corporate Tax Payments Accelerated

All is not sheer velvet, however, for the corporations. Those with an anticipated tax liability of $100,000 or more must make their tax payments earlier in the year. The process is to be stepped up gradually over a five-year period. A firm which uses the calendar year (fiscal year corporations will use corresponding dates) will pay 5 per cent of its 1955 tax in September 1955, 5 per cent in December 1955, and 45 per cent in March and again in June of 1956. Each year the September and December payments will increase and the March and June payments will decrease until there will be equal instalments of 25 per cent in September and December of 1959 and March and June of 1960.

Corporations with less than $100,000 of anticipated tax liability will continue to pay 50 per cent of their tax in March and 50 per cent in June of the year after the income is earned.

A penalty is applied for substantial underestimate of tax.

Greater Offsets to Losses

Under the old tax law, it you suffered a net loss one year, the impact might have been softened somewhat

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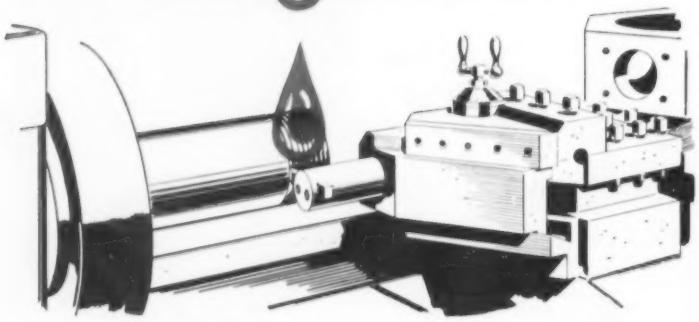

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by a carry-back to the preceding tax year. This carry-back generally meant you received a refund of some or all of the taxes you had paid the year before. Any losses not absorbed in this way would be carried forward for as many as five years following your loss year. These carry-forwards would reduce your taxes in later years, but they were no help in bringing in immediate cash. Now the new law provides for a carry-back for two years instead of one, in addition to the five-year carry forward. In many instances, this will mean that greater refunds of prior taxes will be available to add to your working capital.

These are only the high lights. Over 3,000 technical changes have been made in this colossal overhauling of the federal tax code. You may have to lose some sleep before you understand all the provisions that are important to your particular business. But once you do, chances are you'll be happier with the new law than you were with the old.

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FUTURE MEETINGS of the Industry

NOVEMBER, 1954

28 to Dec. 3 — American Socy. of Mechanical Engineers, Statler Hotel, New York, N. Y.

29-30 — Packaging Institute (Petroleum Packaging Committee), New York, N. Y.

30 — American Society for Testing Materials, Northern California District Meeting, Engineers' Club, San Francisco, Calif.

DECEMBER, 1954

2-7 — National Exposition of Power and Mechanical Engineering, Commercial Museum, Philadelphia, Penna.

3-4 — Interstate Oil Compact Commission, Drake Hotel, Chicago, Ill.

5-8 — American Society of Agricultural Engineers (winter meeting), Edgewater Beach Hotel, Chicago, Ill.

8 — American Society for Testing Materials, Western New York—Ontario District Meeting, Rome—Utica, New York Area.

9 — American Society for Testing Materials, Western New York—Ontario District Meeting (joint meeting with ASM), Buffalo, N. Y.

8-10 — Oil Industry Information Committee, Waldorf-Astoria, New York, N. Y.

12-15 — American Inst. of Chemical Engineers (annual meeting), Statler Hotel, New York, N. Y.

27-30 — American Association for the Advancement of Science, University of California, Berkeley, Calif.

JANUARY, 1955

10-14 — Society of Automotive Engineers (golden anniversary annual meeting), The Sheraton-Cadillac Hotel and Hotel Statler, Detroit, Michigan

20-21 — National Industrial Conference Board, Hotel Astor, New York, N. Y.

FEBRUARY, 1955

13-18 — ASTM Committee D-2 on Petroleum Products and Lubricants, Rice Hotel, Houston, Texas.

15-17 — Texas Oil Jobbers Assn. (management institute), Driskill Hotel, Austin, Texas

16-17 — American Petroleum Institute (Division of Marketing, Lubricating Committee) Sheraton-Cadillac Hotel, Detroit, Mich.

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MARCH, 1955

15-17 — Ohio Petroleum Marketers Association (spring convention and trade exposition), Deshler-Hilton Hotel, Columbus, Ohio.

17-19 — Texas Oil Jobbers Assn. (annual convention and trade exposition), Gunter Hotel, San Antonio, Texas

24 — National Industrial Conference Board, Shamrock Hotel, Houston, Texas

APRIL, 1955

11-15 — Greater New York Safety Council (annual convention and exposition), Statler Hotel, New York, N.Y.

13-15 — American Society of Lubrication Engineers (tenth annual meeting and lubrication exhibit), Hotel Sherman, Chicago, Illinois.

MAY, 1955

9-12 — American Petroleum Institute (Division of Refining, midyear meeting), Jefferson Hotel, St. Louis, Mo.

16-18 — American Petroleum Institute (Division of Marketing, Lubrication Committee), The Greenbrier, White Sulphur Springs, W. Va.

16-18 — American Petroleum Institute (Division of Transportation, Products Pipe Line Conference), Edgewater Beach Hotel, Chicago, Ill.

19-20 — National Industrial Conference Board, Waldorf-Astoria Hotel, New York, N. Y.

23-25 — American Petroleum Institute (Division of Marketing, midyear meeting), Chase and Park Plaza Hotels, St. Louis, Mo.

JUNE, 1955

6-15 — Fourth World Petroleum Congress, Rome, Italy.

12-17 — SAE Golden Anniversary Summer Meeting, Chalfonte Haddon Hall, Atlantic City, N. J.

26 to July 1 — American Society for Testing Materials (annual meeting), Chalfonte-Haddon Hall, Atlantic City, N. J.

OCTOBER, 1955

23-25 — National Assn. of Oil Equipment Jobbers (4th annual meeting), Hotel President, Kansas City, Mo.

31 to Nov. 2 — NLGI ANNUAL MEETING, EDGEWATER BEACH HOTEL, CHICAGO, ILL.

NOVEMBER, 1955

14-17 — American Petroleum Institute (35th annual meeting), San Francisco. Calif.

JUNE, 1956

17-22 — American Society for Testing Materials (annual meeting), Chalfonte-Haddon Hall, Atlantic City, N. J.

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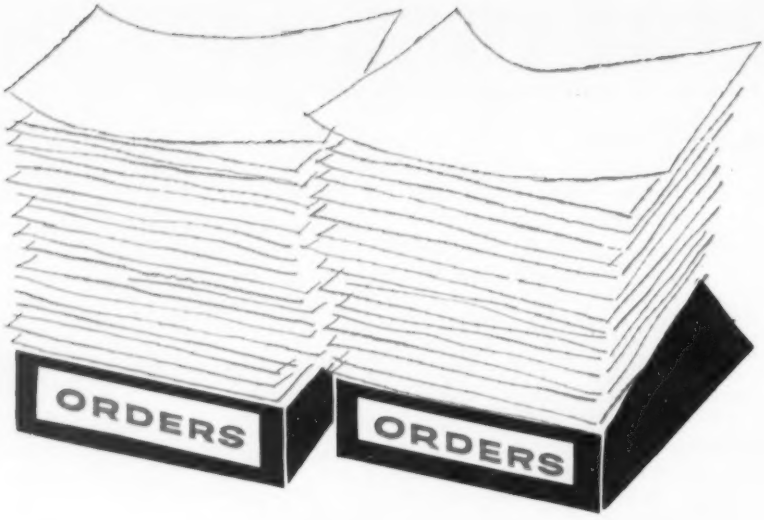

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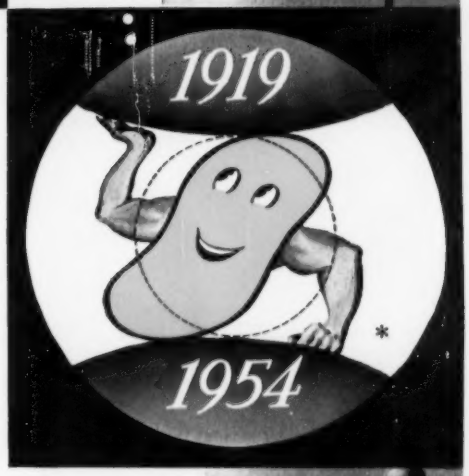
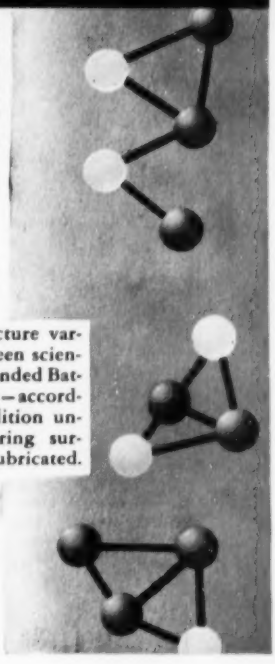
Battenfeld is research and production headquarters for lubricating greases sold under the trade names of the nation's most famous marketers and jobbers.

Your inquiry is cordially invited.



"Never shall the surfaces meet!" says Batlas*, the Battenfeld "strong man" . . . even though pressures reach 90,000 lbs. and tolerances are as close as 1/10,000 of an inch. (**Trade Mark Registration applied for.*)



Molecular structure varies widely between scientifically compounded Battenfeld greases—according to the condition under which bearing surfaces must be lubricated.

* TRADEMARK

BATTENFELD

1919 1954

international headquarters for LUBRICATING GREASES produced for famous marketers

"Business Is Increasing"

BATTENFELD
GREASE & OIL CORPORATION

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J&L STEEL

Jones & Laughlin
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Foote LITHIUM HYDROXIDE

A Primer on the Key Ingredient for Multi-Purpose Greases

ABUNDANT

Vast domestic reserves of lithium ore coupled with expansion of Foote's production unit at Sunbright, Va.—the world's largest lithium chemical plant—these are your assurance of an abundant supply of lithium for your needs.

BASIC

Lithium hydroxide is the accepted ingredient that makes possible the production of a single lubricating grease that resists cold, heat and moisture.

CONSISTENT QUALITY

You can depend on the chemical and physical uniformity, and stability of Foote lithium hydroxide.

Don't delay. Write for the facts about the economies of Foote lithium hydroxide.

Today as always
Foote maintains

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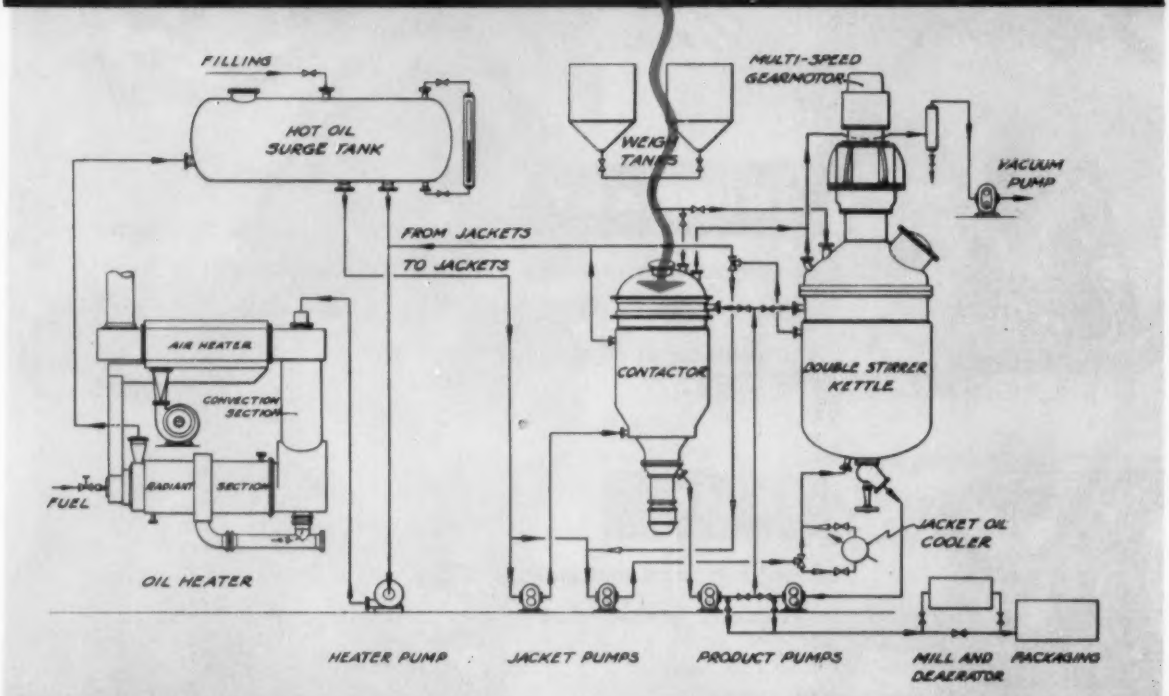
FOOTE MINERAL COMPANY

402 Eighteen West Chelten Building, Philadelphia 44, Pa.

RESEARCH LABORATORIES: Berwyn, Pa. • PLANTS: Exton, Pa.; Kings Mountain, N.C.; Sunbright, Va.

The STRATCO contactor



and How It Simplifies Grease Making

• Now standard equipment in many other processes, the Stratco contactor also is primarily responsible for the comparative simplicity, efficiency and economy of Stratco grease making installations.

As a highly efficient mixer the Stratco contactor provides continuous or batch mixing with very short time cycles. It makes possible the production of more uniform greases with less soap and with simplified laboratory control. It replaces other types of equipment and simplifies plant layout; makes possible either increased production or fewer man hours of operation.

A complete Stratco plant layout is illustrated above. Equipment is adaptable to modernization programs as well as to new installations. Write for details.

STRATFORD ENGINEERING Corporation

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